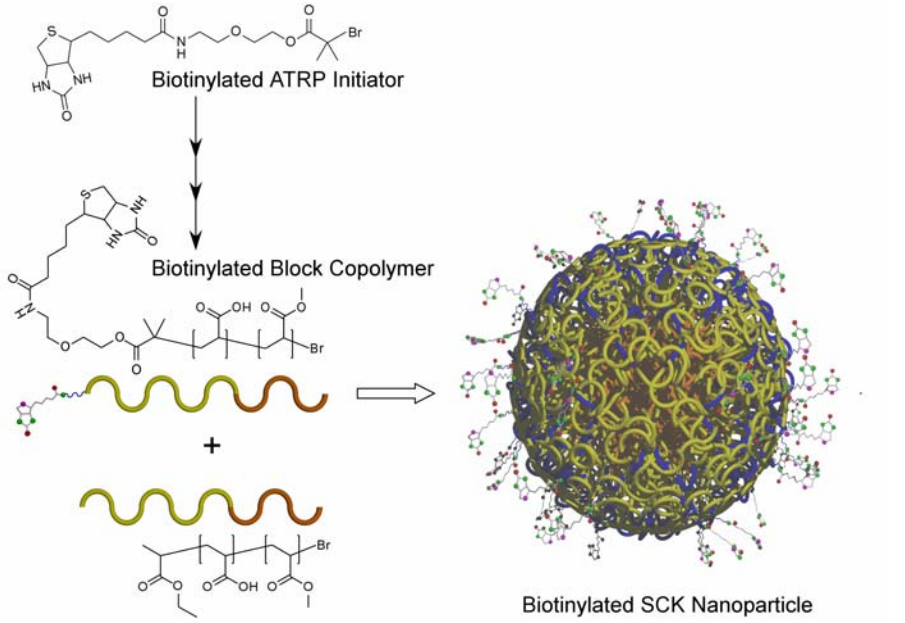
Programming Shell-crosslinked Nanoparticles for Assembly

Karen L. Wooley, Washington University, DMR-0210247
with C. Hawker & K. Carter (IBM) and D. Sogah (Cornell Univ.),

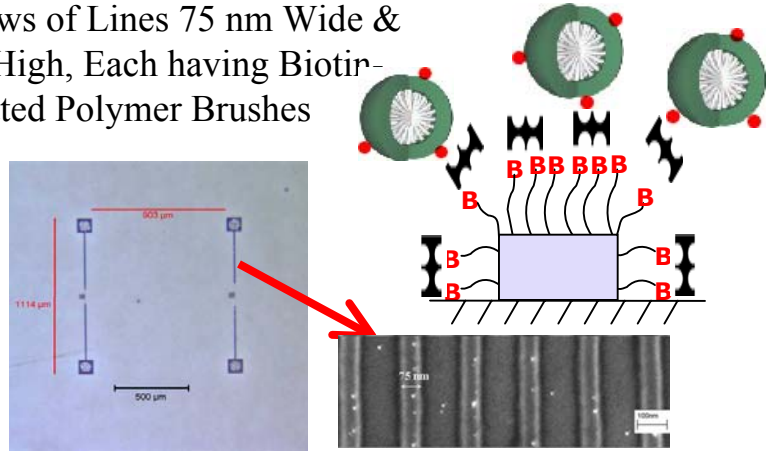
The use of the well-known biotin-streptavidin interaction in a unique manner provides for the assembly of nanoparticles upon nanopatterned surfaces. Interesting new chemistry has been developed as well. For example, a biotinylated initiator for the growth of block copolymers was further transformed into shell-crosslinked nanoparticles having controlled numbers of surface available and bioactive biotin ligands.



J. Am. Chem. Soc. **2004**, *126*(21), 6599-6607.

In unpublished work, nitroxide exchange reactions have been developed as a method to terminate polymer brushes with biotin. This has been conducted for polymer brushes grown upon nanopatterns and the streptavidin-mediated assembly of the nanoparticles is underway.

200 Rows of Lines 75 nm Wide & 50 nm High, Each having Biotin-terminated Polymer Brushes



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Education:

The highly interdisciplinary nature of the research activities have provided for unique experiences for three Ph.D. students with primary appointments in the Wooley laboratory. Zhiyun Chen has worked closely with D. J. Pochan's group at the University of Delaware to conduct advanced electron microscope characterization of the interesting toroidal morphologies, etc. Kai Qi has received enhanced training in the laboratories at IBM, working together with C. Hawker for the nanopatterning and polymer brush growth, and also those of T. Kowalewski (CMU) for AFM studies. Brooke Van Horn has transferred synthetic expertise to M. Mackay's laboratory at Michigan State University. Several other Ph.D. and undergraduate students have benefited from the personnel exchanges, quarterly teleconferences and annual "advance" team gatherings.

Outreach:

The Education 6009: Hands-on Outreach Course for K-8 Teachers was team taught by several members of this NIRT. In addition, visits to local schools occurred with participation by multiple NIRT members during team gatherings.

J. Schaefer (upper left) and C. Hawker (lower left) teaching modules of Educ 6009. Students performing chromatography, directed by M. Mackay and K. Wooley, at a Lansing, MI grade school.